Dual Wavelength InGaAs Avalanche Photodiode Preamplifier Module with Thermoelectric Cooler

CMC Electronics' 264-339814 series uses an InGaAs APD with low ionization ratio of 0.2, with a built-in preamplifier and a thermoelectric cooler (TEC), enabling optimum signal to noise performance.

The APD is coupled to a GaAs FET input transimpedance amplifier in a 12-lead TO-8 package. The amplifier has an overload input protection circuit that sustains high optical power exposure with a very fast recovery time. An integral TEC allows temperature control of the APD, supporting APD module gain and temperature stabilization. The internal temperature can be monitored via an embedded thermal sensor close to the APD. The module is designed for a 100-ohm output load connection (AC or DC coupled, as required by design).

Customizations such as bandwidth selection, NEP screening, responsivity optimization and packaging are available, to fit your system design needs.

Features

- 200 µm InGaAs APD
- 60-100 MHz Preamplifier Module
- Spectral Response: 1050-1600nm (typical use: 1570nm)
- Low k of 0.2 (Low noise) InGaAs APD
- Low Noise Equivalent Power (NEP)
- Fast Overload Recovery
- High Efficiency TEC
- High Quantum Efficiency
- Hermetically Sealed TO-8 Package
- ITAR Free
- ROHS compliant

Applications

- Range Finding
- LIDAR
- Instrumentation
- Laser Profiling
- Free–Space Communications
- Industrial
- Photometry

Table 1. Electro-Optical Characteristics

Unless otherwise specified: T_A = 25°C, V_POS = 5.0 V, V_NEG = -5.0 V, R_L = 100 Ω AC, λ = 1570 nm +/- 10 nm, Cooler OFF (Externally AC coupled through 4.7uF)

Parameter	Min.	Typ.	Max.	Units
Active area		200		µm
Operating Voltage (Note 1)	40	54	85	V
Temperature coefficient of V_{OP}		0.07		V/˚C
ADP dark current		20	50	nA
Responsivity		580		kV/W
Noise equivalent power (Note 2)				
1570 nm [T_{case}=25°C]		110	135	fW/√Hz
1570 nm [T_{case}=85°C]		170	525	fW/√Hz
1570 nm, Cooler ON [T_{case}=85°C]		140	280	fW/√Hz
Output impedance		10		Ω
Bandwidth	60	85		MHz
Rise time (10-90%)		6		ns
Fall time (90-10%)		6		ns
Linear output voltage swing (Pulse)	1.5	2.5	4.0	V
Output offset voltage	-0.75	-0.45	0	V
Thermal sensor				
Voltage output		1.5740		V
Accuracy (at +30°C)	±1.5		±4	°C
Accuracy (-55°C to +130°C)	±2.5		±5	°C
Non-linearity		±0.4		%
Overload recovery for optical power input signal of 1 mW, 20 ns pulse width:				
V_{out} → 200 ns after pulse start			250	mV
V_{out} → 1 µs after pulse start			40	mV
Hybrid Supply current V_POS (pin 10)	25		40	mA
V_NEG (pin 11)	-20		-10	mA

Notes:
1. Each APD receivers will have its individual V_{OP} (provided on its production tests report).
2. NEP values for +85°C are by design and are for reference only. No test values provided on individual test reports. Integration of the noise calculation is based on minimum bandwidth.

Table 2. Absolute-Maximum Ratings, Limiting Values

Parameter	Min.	Max.	Units
APD breakdown, Maximum voltage [HV_POSITIVE (pin7)] (Note 1)		105	V
Recommended overcurrent limit		100	µA
Input Voltage Positive Supply [V_POS (+5V) (pin10)]	+4.8	+6.0	V
Input Voltage Negative Supply [V_NEG (-5V) (pin11)]	-4.8	-6.0	V
Maximum Optical Power, CW		10	µW
Peak value, 20ns pulses <100Hz		100	kW/cm^2
TEC Current	-0.9	0.9	A
Temperature sensor (LM20) Sensor V_{in} (pin 4)	 2.5 1	 5.0 10	 V mA
Sensor output (pin 5)	0.2	2.5	V
Operating Temperature	-40	85	°C
Storage Temperature	-55	125	°C

Note: 1. Absolute maximum over the product Temperature Operating Range (-40°C to +85°C).

To obtain the expected voltage from a specific temperature:

$$V_o = (-3.88x10^{-6}xT^2) + (-1.15x10^{-2}xT) + 1.8639$$

And to convert in Celsius the voltage measured at the sensor output:

$$T = -1481.96 + \sqrt{2.1962 \times 10^6 + \frac{1.8639 - V_o}{3.88 \times 10^{-6}}}$$

In the above formulas:

V_o is the voltage level of the temperature sensor (receiver PIN 5 - T_{sensor} V_{out})

T is the temperature expressed in Celsius.

Figure 1. CMC 264-339814 Series block diagram

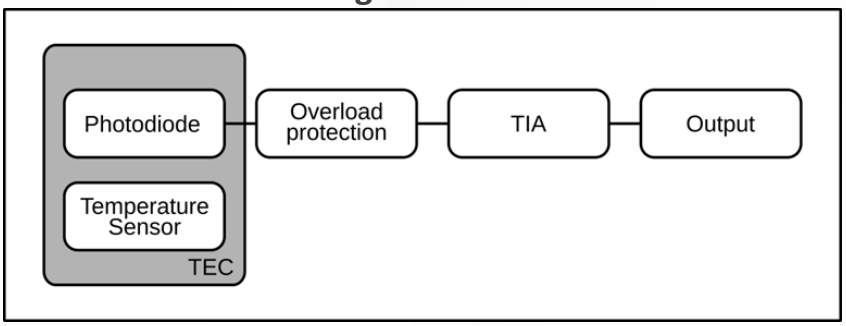
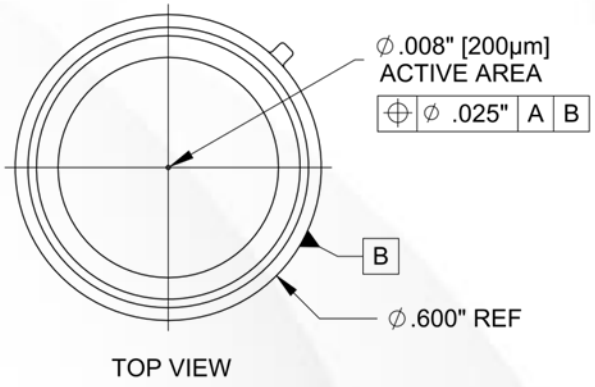
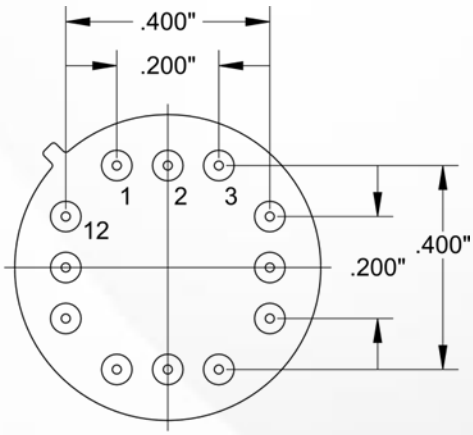


Figure 2. Package Dimension and Pinout

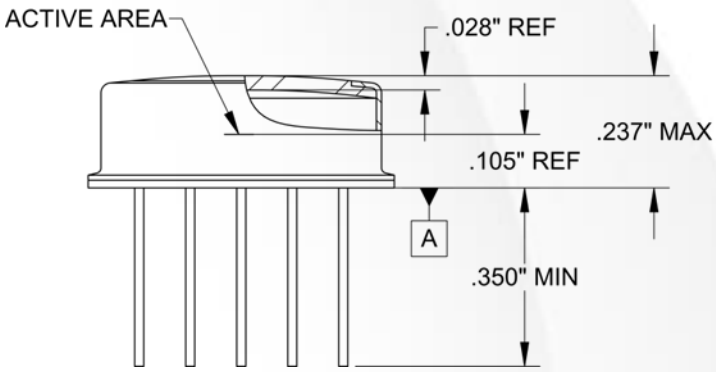
Unless otherwise specified, dimensions are in inches (mm) and are for reference only.



TOP VIEW



BOTTOM VIEW



1	NC	7	HV_POSITIVE
2	TEC -	8	GND
3	TEC +	9	OUTPUT
4	T sensor VS+	10	V_POS (+5V)
5	T sensor Vout	11	V_NEG (-5V)
6	GND	12	GND

VAR Options

-001	InGaAs APD 200 µm, 60-100 MHz TIA, TEC

For more information, visit www.cmcelectronics.ca or email us at opto@cmcelectronics.ca

For information purposes only. To accommodate product improvements, specifications are subject to change without notice.

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